REMARKS

Amendments to the Specification

The specification has been amended to reflect government rights associated with this application.

Amendments to the Claims

Claim 11 has been amended to correct a typographical error.

Claims 20 and 21 are new. Support for these additional dependent claims can be found in at least paragraphs 3, 34, and 39 of the specification. No new material has been added by these claims.

Claims 1-21 are pending.

Discussion of Office Action

In an Office Action dated July 27, 2005, claims 1-19 were rejected.

35 U.S.C. § 103 Rejections

Claims 1-19 stand rejected as being unpatentable over Seo (US 2002/0105005). The Office Action asserts Seo discloses multiple blocking materials, including BPhen and BAlq, citing para. 116. The Office Action concedes that Seo does not disclose a mixture of blocking materials, such as BPhen and BAlq. As support for making the suggested combination, the Office Action further asserts that, "absent evidence otherwise '[i]t is *prima facie* obvious to combine two compositions taught by the prior art as useful for the same purpose, in order to form a third composition which is to be used for the very same purpose' (see *In re Kerkhoven*, 205 USPQ 1069, 1072 (CCPA 1980); *In re Susi*, 169 USPQ 423, 426 (CCPA 1971); *In re Crockett*, 126 USPQ 186, 188 (CCPA 1960))."

However, the cited cases are not analogous to the present application. In *Kerkhoven*, the denied claims were for the mixing of two substances, both disclosed in prior art as detergents, to create a detergent. That is, the use and useful properties of the two components were identical to the use and properties of the resulting compound, and each component was as effective individually as the combined mixture. Similarly, in *Crockett* two compounds were mixed to promote a modular structure in cast iron; each of the compounds was previously known to do so, and the mixture did not have any unforeseen benefits over the individual compounds. In *Susi*, the rejected claims were for a chemical subgenus, the genus of which had been previously disclosed.

As a starting point, one of skill in the art in the field of organic light emitting devices would not casually add extra materials to a device unless there was a significant benefit expected from adding the extra materials. If an additional material were expected to merely serve the same purpose as other materials already present, the material would not be added. This is because the OLED fabrication techniques can be complex, and every extra material compounds the complexity. Layer thickness and structure should be carefully controlled, and adding extra materials can introduce unexpected variables. Every extra material present in the device creates the risk of unexpected adverse consequences. For example, a minor impurity of the extra material in a layer where that material is not meant to be can significantly and adversely affect device performance. For vacuum fabricated OLEDs, the cost and difficulty associated with the fabrication apparatus for adding an extra material increases exponentially with each additional material. Adding an extra material to an OLED is not as simple as pouring an extra detergent or modular structure promoter into a vat.

Moreover, one of skill in the art would not expect a mixture of any two "blocking materials" to "form a third composition which is to be used for the very same purpose" as suggested in the office action. Blocking materials are selected to block charge carriers and / or excitons from escaping from a particular layer in a device, usually the emissive layer. In general, the ability of a material to "block" charge carriers or excitons in an adjacent layer depends upon the *relative* properties of the blocking material compared to those of the adjacent layer. Relevant properties include carrier mobilities, and energy levels (HOMO or highest occupied molecular orbital levels, and LUMO or lowest unoccupied molecular orbitals). These ideas are explained in para. 38 of the instant specification and in the references cited in that paragraph. For example, a material may be considered a good hole blocker in a particular device if it has a hole mobility that is significantly lower than, and / or a HOMO energy level significantly lower than, that of the emissive layer *in that particular device*. This is because a hole may have difficulty moving into a layer with a hole mobility and / or HOMO energy level significantly lower than the layer where the hole is presently located. However, the emissive layer of a different device designed to emit a different color of light may have different mobilities and / or HOMO and LUMO energy levels. Because it is the *relative* properties that are relevant (such as the difference in the HOMO levels or hole mobilities), a material may be a good blocker in one device *but not in another*. With reference to the specific materials discussed in the Office Action, for example, BPhen has a larger band gap than BAlq, such that BPhen may block excitons from leaving an emissive layer designed to emit blue light, whereas BAlq may not block such excitons. This is not to say that BAlq is not a good blocking material -- para. 116 of Seo is correct in indicating that BAlq is a known blocking material. However, the devices in which one of skill in the art would choose to use BAlq as a blocking material may be *different devices* than the ones in which BPhen would be chosen.

Moreover, Seo, in para 69, defines a "blocking material":

> Note that the term blocking material denotes a material having the highest excitation energy among the materials contained in the mixture region.

Thus, using this definition of Seo, the two materials *could not* be combined in the manner suggested "in order to form a third composition which is to be used for the very same purpose" as indicated in the case law cited in the office action. This is because organic materials in a mixture generally retain their individual excitation energies. BPhen has an excitation energy (the difference between the LUMO and the HOMO) of 3.4 eV. BAlq has an excitation energy of 2.9 eV. If the two materials from Seo were mixed as suggested in the office action, BAlq, having a lower excitation energy than BPhen, would not be a "blocking material" under the definition of Seo and thus would not be serving the purpose in the mixture of being a "blocking material" as defined by Seo.

Applicants further submit that Seo teaches away from mixing blocking layer materials. Seo teaches that blocking layer materials are effective "due to their high excitation energy level" (paras. 69, 116), where the "excitation energy level" is the energy difference between the HOMO and LUMO levels of a material (see para. 64). Seo further teaches that materials with a low HOMO level are effective blocking layer materials (see para. 70), and that a blocking material is the material with the highest excitation energy among materials in a region (para. 69). One skilled in the art would understand that Seo therefore teaches use of a *single* blocking layer material. One skilled in the art would therefore have no motivation to combine blocking layer materials as suggested by the Office Action, because an additional material would at best have the same HOMO or excitation energy, and more likely would have a different HOMO and / or excitation energy such that one of the materials was inferior to the other using the Seo criteria.

INTERVIEW SUMMARY

Applicants thank the examiner for the courtesy extended during an interview on October 26, 2005. Applicants' record of the interview as required by MPEP 713.04 is as follows:

(A) No exhibits or demonstrations were shown.

(B) Claims 1-19 were discussed.

(C) The following art was discussed: Seo (US 2002/0105005)

(D) No amendments were proposed or discussed, although claims 20 and 21 were subsequently added as discussed above.

(E) Applicants argued that Seo does not teach the suggested combination of blocking layers.

Applicants argued that blocking layer materials are not interchangeable and that one of skill in the art would not be motivated to mix two blocking materials for the purpose of creating a mixture designed to block.

(F) No additional matters were discussed.

(G) The examiner agreed to consider arguments to be presented in a response.

(H) The interview was not conducted via email.

CONCLUSION

In view of the foregoing remarks, Applicants respectfully submit that the present application is in condition for allowance. Early and favorable action by the Examiner is earnestly solicited.

Respectfully Submitted,

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